James Chadwick: discovered neutrons (uncharged particles in the nucleus)

Niels Bohr: discovered evidence that electrons in atoms are arranged according to energy levels; led to the modern atomic model; electron clouds rather than orbits

1930’s: matter is made up of atoms; continued research on subatomic particles, these can be broken down into smaller particles called quarks

Matter made up of only one kind of atom is called an element.

Elements combine to form air (Nitrogen & Oxygen), minerals in rocks (Calcium & Sodium), and liquids (Hydrogen and Oxygen as in water) for example.

Gold, Silver, Aluminum, and Iron are all elements. Some elements are naturally occurring and some are synthetic or man-made.

We sort and organize the elements according to their properties in a chart called the Periodic Table.

The table is made up of rows called Periods and columns called Groups.

All elements in a Period have the same number of energy levels and all elements in a group have similar properties related to their structure and tend to form similar bonds.

Identifying Characteristics: Each element is different and has unique properties described by looking at relationships between the atomic particles in each element.

Ex. Atomic Number= #of protons; each element increases by one

Isotopes: every atom of the same element has the same number of protons (atomic number) but atoms of the same element can have different numbers of neutrons.

Ex. Cl-35 and Cl-37

Some physical properties included with each element in the periodic table include:

Mass Number: the number of protons plus the number of neutrons

Ex. Cl has 17 protons always, but it can have a different number of neutrons. Its isotopes Cl-35 and Cl-37 have different numbers of neutrons.

We can tell the number of neutrons by subtracting:

Atomic Number from the Mass Number:

35-17=18 neutrons in Cl-35 and

37-17=20 neutrons in Cl-37.

An increase in the number of neutrons equals an increase in the total mass of the atom

Atomic Mass: average mass of all isotopes

Ex. Chlorine Cl-35 makes up 76% of all Chlorine atoms found while Cl-37 makes up the other 24%. The average mass of all isotopes is 35.45

Classification of Elements: 3 Categories

1. Metals: shiny, metallic luster, good conductors of heat and electricity, malleable, ductile, solids at room temperature (except Mercury Hg liquid)
2. Nonmetals: dull, poor conductors of heat and electricity, many are gases at room temperature (except Bromine Br liquid). Solid nonmetals are brittle (break easily).

The nonmetals are essential to the chemicals of life and make up more than 97% of your body. Ex. Carbon, Nitrogen, Calcium, Oxygen, Hydrogen (p.111 graphic).

They are found on the right side of the periodic table (except Hydrogen)

1. Metalloids: have characteristics/properties of both metals and nonmetals and are solids at room temperature.

They are found between metals and nonmetals on the periodic table. Some are shiny and many are conductors, but not as good as metals.